

Practice 7-1

Example Exercises

Example 1

Graph each function. Identify each function as modeling either exponential growth or exponential decay.

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|-----------------------------------------|---------------------|----------------------------------------|-----------------------------------------|
| 1. $y = 6(1.13)^x$ | 2. $y = 0.2(0.3)^x$ | 3. $y = 3.1(1.7)^x$ | 4. $y = \frac{2}{3}(0.7)^x$ |
| 5. $y = 0.17\left(\frac{2}{3}\right)^x$ | 6. $y = 6(4)^x$ | 7. $y = 0.5\left(\frac{3}{7}\right)^x$ | 8. $y = 1.24\left(\frac{5}{4}\right)^x$ |

Example 3

11. Suppose you have \$15,000 in equipment for your business. You expect the equipment will be worth 10% less each year.
- Your friend says the equipment will be worth nothing in 10 yr, since that would be 100% depreciation. Explain why that is incorrect.
 - Write an equation for this depreciation.
 - Find how much the equipment will be worth in 10 yr.

Activity

Write an exponential function to model each situation. Find each amount after the specified time.

- A tree 3 ft tall grows 8% each year. How tall will the tree be at the end of 14 yr?
- The price of a new home is \$126,000. The value of the home appreciates 2% each year. How much will the home be worth in 10 yr?
- A motorcycle purchased for \$9,000 today will be worth 6% less each year. For what can you expect to sell the motorcycle at the end of 5 yr?

Practice 7-1

Mixed Exercises

Write an exponential function to model each situation. Find the value of the function after 8 yr.

1. A \$12,000 car depreciates 25% each year.
2. A \$22,000 truck depreciates 12% per year.
3. A population of 2785 brown bears increases 3% each year.
4. A \$45,000 investment increases at a rate of 9.8% per year.
5. The population of the animals you are studying is decreasing by 1.5% each year. There were about 2,000,000 of them world-wide this year.

Identify each function as modeling either exponential growth or exponential decay. What is the percent of increase or decrease for each function?

6. $y = 72(1.6)^x$ 7. $y = 24(0.8)^x$ 8. $y = 2.02(2.01)^x$ 9. $y = 0.9(0.92)^x$

Evaluate and then graph each function for the domain $\{0, 1, 2, 3, 4, 5\}$.

10. $y = 90(1.1)^x$ 11. $y = 23,000(0.12)^x$ 12. $y = 2.35(1.95)^x$ 13. $y = 32(0.85)^x$

14. Suppose you have 1 g of a mixture that is losing 1% of its mass each hour by evaporation.
 - a. What is the decay factor of the mixture?
 - b. Write an equation to model the mass of the mixture.
 - c. Use the formula to predict the time when there will be 0.1 g left.
15. Suppose a new business borrows \$50,000 from you for start-up funds. The business will repay the loan in one payment 5 yr from now. The interest rate is 12.5%, compounded yearly.
 - a. What is the growth factor of the loan?
 - b. Write an equation to model the growth of the loan.
 - c. Find the amount the business will owe you when the loan comes due.
16. Suppose someone says he will loan you \$100. He will charge you 10% interest per day. How much will you owe him at the end of 30 days?
17. Suppose the retired professor who lives next door offers you work for the next 30 days. He says he will pay you \$500 per day, or, if you prefer, he will pay you \$.01 the first day and will double your pay each day after that.
 - a. How much would you earn with the first option?
 - b. Write a formula for your pay on any day with the second option.
 - c. How much would you earn on the 30th day with the second option?
(Hint: Remember that the 30th day is the 29th doubling.)

Practice 7-2

Example Exercises

Example 1

Write an equation to describe each exponential function, $y = ab^x$.
Graph the equation.

1. The base is 3. The graph passes through the point (2, 1).
2. The base is 3. The graph passes through the point (-2, -1).
3. The base is 0.1. The graph passes through the point (-2, 1).
4. The base is 0.1. The graph passes through the point (2, -1).

Graph each exponential function using a graphing calculator.

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|-------------------------------------|---------------------------------------|----------------------------------------|----------------------|
| 5. $y = 3^x$ | 6. $y = (0.2)^x$ | 7. $y = 0.1(0.2)^x$ | 8. $y = 8(0.2)^x$ |
| 9. $y = \left(\frac{1}{3}\right)^x$ | 10. $y = 5\left(\frac{1}{3}\right)^x$ | 11. $y = -5\left(\frac{1}{3}\right)^x$ | 12. $y = 2(2)^{x+2}$ |
| 13. $y = 2(2)^{4x}$ | 14. $y = -2(0.2)^{4x}$ | 15. $y = (2)^{-x}$ | 16. $y = (4)^{-x}$ |

Example 3

Use the formula for continuously compounded interest, $A = Pe^{rt}$, to find the amount after the specified time.

21. \$1000 for 4 yr at 5% compounded continuously
22. \$1500 for 2 yr at 7% compounded continuously
23. \$100 for 30 yr at 6% compounded continuously
24. \$500 for 2 yr at 6% compounded continuously

Practice 7-2**Mixed Exercises**

Evaluate each expression to 4 decimal places.

1. e

2. $\frac{1}{e}$

3. $4e^3$

4. $\frac{6}{5e^4}$

5. $3e^{10}$

Use the formula for continuously compounded interest, $A = Pe^{rt}$, to find the amount after the specified time.

6. \$600 for 5 yr at 8% compounded continuously

7. \$600 for 6 yr at 5% compounded continuously

8. \$200 for 40 yr at 7% compounded continuously

9. \$400 for 1 yr at 7% compounded continuously

Write an equation to describe each exponential function, $y = ab^x$. Graph the equation.

13. The base is 2. The graph passes through the point (1, 4).

14. The base is 2. The graph passes through the point (1, 2).

15. The base is 4. The graph passes through the point (1, 2).

16. The base is $\frac{1}{2}$. The graph passes through the point (-1, 4).

17. The base is $\frac{1}{2}$. The graph passes through the point (-1, 2).

18. The base is $\frac{1}{2}$. The graph passes through the point (-1, -4).

19. The base is $\frac{1}{2}$. The graph passes through the point (1, 4).

Activity

Solve each equation. Find and discard any extraneous solutions.

1. $x^{\frac{1}{2}} = 13$

2. $3\sqrt{2x} = 12$

3. $\sqrt{5x+1} = \sqrt{4x+3}$

4. $\sqrt{x^2+3} = x+1$

5. $\sqrt{3x} = \sqrt{x+6}$

6. $x = \sqrt{x+7} + 5$

7. $x - 3\sqrt{x} - 4 = 0$

8. $\sqrt{x+2} = x-4$

9. $\sqrt[3]{5y+2} - 3 = 0$